UCONN
UNIVERSITY OF CONNECTICUT

Department of Statistics
College of Liberal Arts & Sciences

STAT 3375Q: Introduction to Mathematical Statistics I

Spring 2024

Week 7 Homework Exercises Discussion Date: 1 March 2024

Problem 4.61
What is the median of a normally distributed random variable with mean μ and standard deviation σ?

Solution:

Problem 4.71
Wires manufactured for use in a computer system are specified to have resistances between 0.12 and 0.14 ohms. The actual measured resistances of the wires produced by company A have a normal probability distribution with mean 0.13 ohm and standard deviation 0.005 ohm.

a) What is the probability that a randomly selected wire from company A's production will meet the specifications?

b) If four of these wires are used in each computer system and all are selected from company A, what is the probability that all four in a randomly selected system will meet the specifications?

Solution:

Problem 4.73
The width of bolts of fabric is normally distributed with mean 950 mm (millimeters) and standard deviation 10 mm.

a) What is the probability that a randomly chosen bolt has a width of between 947 and 958 mm?

b) What is the appropriate value for c such that a randomly chosen bolt has a width less than c with probability 0.8531?

Solution:

Problem 4.77
The SAT and ACT college entrance exams are taken by thousands of students each year. The mathematics portions of each of these exams produce scores that are approximately normally distributed. In recent years, SAT mathematics exam scores have averaged 480 with standard deviation 100. The average and standard deviation for ACT mathematics scores are 18 and 6, respectively.

a) An engineering school sets 550 as the minimum SAT math score for new students. What percentage of students will score below 550 in a typical year?

b) What score should the engineering school set as a comparable standard on the ACT math test?

Solution:

Problem 4.81

a) If $\alpha > 0$, $\Gamma(\alpha)$ is defined by $\Gamma(\alpha) = \int_0^\infty y^{\alpha-1}e^{-y}dy$, show that $\Gamma(1) = 1$.

b) If $\alpha > 1$, integrate by parts to prove that $\Gamma(\alpha) = (\alpha - 1)\Gamma(\alpha - 1)$.

Solution: